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in the present case in the broadest sense. He starts out by postulating general isostasy thus making the term nearly equivalent to a universal static conservation. His theme is stated as follows: "Let us postulate that the greatest features of the earth's relief, such as continents and great plateaus, are sustained isostatically, and that the small features, such as hills and small mountains, are within the competence of terrestrial rigidity, and then let us inquire what the pendulum work of the Coast Survey has to tell of the status of features of intermediate size, namely the greater mountains and smaller plateaus."

After describing the methods followed in making the determinations the details of the various stations at which pendulum measurements were made are discussed. Although the results of the calculations deviate greatly from what would be expected according to the hypothesis of isostasy the measurements are found to be "six times as discordant from the point of view of rigidity as they are from the point of view of isostasy."

In conclusion it is stated that the "measurements of gravity appear far more harmonious when the method of reduction postulates isostasy than when it postulates high rigidity. Nearly all the local peculiarities of gravity admit of simple and rational explanation on the theory that the continent as a whole is approximately isostatic, and that the interior plain is almost perfectly isostatic. Most of the deviations from the normal arise from excess of matter and are associated with uplift. The Appalachian and Rocky Mountains and the Wasatch plateau all appear to be of the nature of added loads, the whole mass above the neighboring plains being rigidly upheld. The Colorado plateau province seems to have an excess of matter, and the Desert Range province may also be overloaded. The fact that the six stations from Pike's Peak to Salt Lake City, covering a distance of 375 miles, show an average excess of 1345 rock-feet indicates greater sustaining power than is ordinarily ascribed to the lithosphere by the advocates of isostasy."

CHARLES R. KEYES.

Text-Book of Palæontology. Vol. I., Part I. By KARL A. VON ZITTEL. Translated and edited by CHARLES R. EASTMAN, PH.D. London: Macmillan & Co., Ltd., 1896.

An English edition of von Zittel's *Paläontologie* is the most welcome of palæontological works that has appeared in a long time. The original edition while largely used in this country did not, on account of being in a foreign language, meet all the wants of American students, particularly the younger ones. No department of science has been more in need of a good English text-book than palæontology. Educators in general will owe to Dr. Eastman a deep debt of gratitude for providing our colleges and higher schools with a "translated, revised and enlarged edition" of the best manual on palæontology that has ever been written. Professor von Zittel is to be congratulated not only for the improvement presented by his new text-book, but also, as shown by the results, for having entrusted the preparation of the translated edition to such excellent hands.

To one accustomed only to the standard English works on palæontology, or even to the majority of foreign ones, the style and mode of treatment adopted by the author must seem a welcome innovation. The plan on which it is written is in fact original with Professor von Zittel, and was first adopted by him in the larger work, for which he is famous, the *Handbuch der Paläontologie.* It may be regarded as the best method yet devised for treating, in one and the same book, not only the main facts of the science as viewed from the biological side, but also systematic palæontology. Authors of zoölogical text-books are confronted with the same difficulty, how to relegate to the systematic and the general part each its due share of attention, without confusing the student nor presupposing for him too much technical knowledge. The great success of von Zittel's method has been demonstrated during the twenty years his larger treatise has been in use, and justifies its extension to an elementary work.

Another feature which the present text-book shares in common with the *Handbuch* is its richness of illustration. Its figures are necessary to the advanced student, and everyone knows for himself how dependent he is on good figures for an understanding of new forms; how much more essential is it that the beginner be supplied with an abundance of illustration. Perhaps in no department of science is the need of pictorial representation so great as in palæontology, owing to the fragmentary or distorted condition of the bulk of the fossil material. The German edition, which comprises 950 pages, is provided with 2500 woodcuts; the translation promises to increase this number to upwards of 3000. Part 1, which forms the immediate subject of this notice, has fifty-five illustrations more than the corresponding portion of the original. Great discretion has been exercised to select typical forms for representation, and in the case of diagrams or restorations, pains have been taken to emphasize the more salient features. In some cases, hypothetical restorations that have been since proved to be faulty are altogether discarded, or in other cases are replaced by more perfect ones. In fact, the aim has been to make the pictorial or visualized part not less intelligible and truthful than the descriptive.

As to the subject-matter, the arrangement and coördination is on the whole philosophical and well balanced. In a work of this kind, the relative importance to the palæontologist must be the criterion which governs the amount of space devoted to each group. Hence certain groups which to the zoölogist are of but slight interest are necessarily treated in considerable detail in a palæontologist's manual, and on the other hand numerous subdivisions are passed over unnoticed in the latter, which occupy an important place in zoölogical text-books. In the original, the allotment of space was determined for each class by the author, but in the translation the same ratio has not been preserved, owing to variations in the amount of additional matter contributed by the different collaborations. The result is that some sections have been treated with greater thoroughness than others, but the fault, if it be one, is rather to be commended than condemned. That is, it is better that certain groups receive the painstaking revision of an acknowledged expert, as in the case of the Echinoderms, Bryozoans, or Brachiopods, than that the character of the work as a whole be elevated only a little above the high standard laid down in the original.

This brings us to speak more particularly of the nature of the revision which the English translation has undergone, and also of the classification employed. It was originally intended to bring out a strictly literal translation of von Zittel's *Grundzüge der Paläontologie*, which should follow closely the new German edition. But palæontology is not a fixed science, and fresh discoveries are constantly causing changes and improvements in every system. Hence, to be abreast of the times, a text-book must include the results of the latest authenticated observations, and this can only be done nowadays by enlisting the aid of a body of investigators scattered over the entire field of science. It is to the lasting credit of Professor von Zittel, be it said, that he consented to an arrangement whereby portions of his newly completed treatise were parceled out to a dozen or more specialists for detailed revision and enlargement; and it also speaks well for the energy of Dr. Eastman in enlisting the sympathy and assistance of the men best fitted for the undertaking. It certainly must require unbounded magnanimity for an acknowledged master of the science to see a work of his, scarcely dry from the press, passing into the hands of different men for the sole purpose of picking it to pieces and building it up again; to see the introduction of a different terminology, or worse still, a classification different from his own; and finally to see the names of other authors appearing at the close of the several chapters, each being awarded a portion of the credit for the excellence of the work. Doubtless all this was not accomplished without a struggle, for it is hard for any one who has long been accustomed to familiar names or systems, to see them encroached upon or entirely replaced by others. It may be questioned whether Continental workers are entirely in sympathy with the younger American school of palæontologists; yet it is clear that so great an author as Karl von Zittel has confidence in their methods, or he would hardly have permitted such changes to be made in his book. His attitude toward this school may also be gathered from a remarkable address before the International Congress of Geologists, reprinted in a late number of the *American Geologist.* We must certainly regard him not only as one of the ablest but as one of the most progressive of modern palæontologists.

To comment briefly upon the various chapters we note first that the Introduction is condensed into sixteen pages, in which the main principles of the science are expounded. The next twenty-five pages are devoted to the Protozoa, Brady's system having been followed in the main for the Foraminifera and Haeckel's for the Radiolaria. The treatment of the sponges, which also occupies twenty-five pages, betrays a master hand. The classification put forward by the author in the *Handbuch*, remains today, with a few unimportant modifications, the best that has been devised. The chief criticism that may be urged against this section is the adoption of too many needless terms proposed by Rauff; the figures and descriptions, however, are of their usual excellence, and the same is true of the corals. The author has been very conservative in his handling of both the Anthozoa and Hydrozoa. It would have been well had a greater notice been taken of American forms, and a more natural classification adopted. It is evident that pages 103–5 are to be considered as replaced by the more extended treatment of the same forms under the Bryozoa, and their double insertion may be overlooked in consequence. It is to be regretted also that the graptolites were not more extensively described, although abundant references to the literature are supplied at the end of the chapter.

Coming to the Echinoderms, which occupy 125 pages, we note the first great innovation, as nearly the whole section has been fundamentally revised and enlarged. The late eminent crinologist, Mr. Charles Wachsmuth, is mainly responsible for the condition of the Crinoids and Blastoids, valuable notes, however, having also been supplied by Mr. F. A. Bather and Dr. Otto Jaekel. The Ophiuroids and Asteroids were put in their present excellent condition by Mr. Percy Sladen, vice president of the Linnean Society, and to the same high authority credit is due for having revised the entire Echinoid chapter in accordance with the latest approved classification. Some notes on the Worms were contributed by Dr. G. J. Hinde, but this section is not appreciably extended.

The subkingdom Molluscoidea is the next to claim our attention. The chapter on Bryozoans has been entirely rewritten and greatly extended by Mr. E. O. Ulrich. Such a detailed treatment as this part presents would have been more appropriate for a handbook of palæontology than for an elementary treatise, but the unusually large amount of space devoted to the group is excusable perhaps on account of the absence of a correspondingly larger work to which students may refer. Nevertheless we are fortunate in having an extended account of this difficult group made so accessible.

The chapter on the Brachiopods may be regarded as the latest and highest authority for our knowledge on the subject. It has been very skillfully drawn up by Mr. Charles Schuchert, of the U. S. National Museum, and has received some additional illustrations from the writings of Professor C. E. Beecher. The classification adopted is that employed by Mr. Schuchert in his excellent "Synopsis of American Fossil Brachiopoda," and represents an extension of the system originated by Professor Beecher. Every known genus of Brachiopods, fossil and recent, finds notice here, and the condensation is marvelous. The work could have been amplified to almost any desired extent, but it could hardly have been more complete, concise, and clear. It goes without saying that the synonymy indicated is approved by the leading authorities on this group. Considering the scope and nature of the text-book it is difficult to see how this chapter could have been very materially improved.

Only the introduction to the Pelecypods is contained in Part 1, but its improvement over the original is manifest, and we are able to form some idea of what may be expected from Dr. Dall, on this group and the Gastropods. The appearance of the concluding part of the first volume will be awaited with great interest, since without doubt the contributions of Messrs. Hyatt, Beecher, Clarke, Scudder, and others who are understood to be engaged on its revision will so elevate the character of the work as to render it the standard authority on the subject for years to come.

Palæontological science is certainly beholden to Wachsmuth, Sladen, Ulrich, Schuchert, Dall, and the others for their labors of love in trying to make this an authoritative and trustworthy text-book. How well they have succeeded remains to be determined after the book has been used in the laboratory, and it is certainly to have a wide use here. The improvement is so marked over the German edition, the "translation" contains so little from the original, and the "revision" is so complete that the question naturally arises whether Dr. Eastman could not just as well have gone a little farther in his work and made it a text-book by American authors which would have held the same place among English-speaking people as the original *Handbuch* does among the Europeans.

CHARLES R. KEYES.

Die Eruptivgesteine des Kristianiagebietes. II. Die Eruptionsfolge der triadischen Eruptivgesteine bei Predazzo in Südtyrol. By PROFESSOR W. C. BRÖGGER. Pp. 1–183, with 19 figures in the text. Kristiania, 1895.

For the purpose of gaining more light upon certain eruptive relationships of the rocks of the Christiania region, Professor Brögger and his friend Professor Ussing spent eight days in studying this classic locality of the south Tyrol. In a delightful introduction some idea is given of the perennial interest of the region to geologists by reference to the long roll of the most famous workers in geology preserved in the old guest-book of the "Golden Ship" at Predazzo.

The name *monzonite* (from the village of Monzoni) was first applied to the eruptive rocks of this region by Lapparent in 1864, but since his time different authors have used it in various senses. The earlier writers usually referred to these rocks as syenites. Tschermak in 1869